Ontario

Apprenticeship
In-school Curriculum Standards

Plumber

Level 1

306A

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Introduction

This new curriculum standard for the Plumber trade is designed from the LEARNING OUTCOMES, which were developed from the industry-approved training standard.

The curriculum is organized into **3 levels** of training, each including reportable subjects containing LEARNING OUTCOMES to reflect the units of the training standard. The hours charts indicate how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are Cross Referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects follows a natural progression of learning through the training program. This structure will allow training centres and apprentices' flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards for Plumber. However, the curriculum identifies only the learning that takes place off the job, in a training environment. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to assure that all apprentices have achieved the LEARNING OUTCOMES identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of LEARNING OUTCOMES.

Implementation:
January 2007

Stakeholders Information

A consortium of five colleges of applied arts and technology, working in collaboration with the MTCU (Ministry of Training, Colleges and Universities) and industry stakeholders, participated in the development of this document. A Project Steering Committee (PSC) was struck to guide the project development process for the Plumber documents.

The PSC worked with industry representatives during the development of the curriculum to ensure content validity. During various stages of the process, the PSC and participating industry advisory groups evaluated the draft curriculum documents and provided feedback and recommendations for revisions. The format that is used in this document has been approved by the MTCU.

Program Summary of Reportable Subjects

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
S00021	Workplace Safety, Rigging and Hoisting – Level 1	30	26	4
S00022	Plumbing Systems – Level 1	90	90	0
S00023	Tools and Piping Methods – Level 1	48	0	48
S00024	Trade Calculations – Level 1	24	24	0
S00025	Trade Documentation – Level 1	24	12	12
S00026	Welding – Level 1	24	3	21
	Total	**240**	**155**	**85**

Program Summary by Level & Evaluation & Testing

Number:	S00021
Title:	**Workplace Safety, Rigging and Hoisting**
Duration:	30 Total Hours
	Theory: 26 Hours Practical: 4 Hours
Prerequisites:	None
Co-requisites:	S00021, S00023, S00024, S00026

Evaluation Structure:

Theory Testing	90%
Final Assessment	10%

Reportable Subject

Number:	S00021.1	
Title:	**Codes, Acts and Regulations**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	None	
Cross Reference to Training Standards:	U5455	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate safe working habits and procedures in accordance with applicable safety standards and regulations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Identify applicable acts, code, and regulations:
- identify the Occupational Health and Safety Act (OHSA) and Regulation
- explain the difference between the "Act" and the "Regulations"
- identify the sections of OHSA which deal with the construction industry

1.2 Interpret applicable acts, codes, and regulations:
- identify the group responsible for enforcement of the construction safety and health found in the OHSA
- state the responsibilities of the employer, worker, and an inspector
- explain when a worker may refuse work
- define a supervisor and a competent worker
- explain when a supervisor and safety officer/committee must be appointed

1.3 Apply sections of applicable acts, codes, and regulations dealing with:

- personal protective clothing
- hand and power tools
- flammable substances
- housekeeping practices

1.4 State the cause of most construction accidents.

Number: S00021.2

Title: **Personal Protective Equipment and Personal Hygiene**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5455

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to protect self and others through the use of appropriate work dress, personal protective equipment, and personal hygiene.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 Identify and interpret sections of the OHSA, Construction Safety Association of Ontario (CSAO) guidelines, and company/customer standards related to personal protection.

2.2 Determine the requirements for acceptable work dress and personal protective equipment, including:
- protective head wear, foot wear, and eyewear
- hearing protection and face mask

2.3 Select, adjust, wear and maintain work dress and personal protective equipment for maximum protection and suitable to the given task, including:
- protective work clothing, headwear, footwear, and eyewear

2.4 Identify appropriate personal standards and list any hygiene and/or appearance requirements.

2.5 Determine hygiene and personal appearance standards from set requirements.

2.6 Comply with requirements of client or company, including:

- wearing company uniform
- keeping uniform in a neat and clean condition

Number:	S00021.3	
Title:	**Recognize and Assess Hazardous Conditions**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00023, S00026	
Cross Reference to Training Standards:	U5455.0	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize and assess hazards, hazardous conditions, and potential damage and/or injury with equipment and/or materials that are not in compliance with the OHSA, WHMIS, and company/employer standards, as well as applicable codes and regulations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Identify codes, standards, and regulations that may be violated, including:
- OHSA and client and/or company safety regulations

3.2 Identify conditions, material, or equipment that may be a safety hazard, including:
- personal protective equipment
- hand and power tools
- rigging equipment
- wire and fibre rope
- scaffolds, guardrails, ladders, and lifts
- trenching and shoring
- unprotected openings and torches

3.3 Assess the hazardous condition, material, or equipment.

3.4 Note violation of codes and regulations by:

- determining possible consequences
- identifying causes and responsibility
- determining how quickly action must be taken

3.5 Identify the potential damage and/or personal injury that may occur including:

- falls causing cuts, bruises, abrasions, and burns to eyes, back, hands, knees, feet, and hearing
- damaged hand and power tools, equipment, and fixtures
- damages to the work site and injury of co-workers

Number:	S00021.4	
Title:	**Control Hazards**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00023, S00026	

Cross Reference to Training Standards: U5455.0

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to describe how to control hazardous conditions, equipment, and material in compliance with the OHSA, WHMIS, and company/employer standards, as well as applicable codes and regulations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Identify appropriate actions to correct and make safe the hazardous condition, material or equipment.

4.2 Identify relevant safety acts or company/customer standards.

4.3 Identify steps to take to prevent further hazards.

4.4 Report hazards to appropriate personnel.

Number: S00021.5

Title: Work Platforms

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021

Cross Reference to Training Standards: U5455

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to safely plan the erection, use, and dismantling of platforms and scaffolding.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

5.1 Identify and/or select approved scaffold parts.

5.2 Determine safe condition of scaffolding prior to use.

5.3 Describe safety procedures to follow to ensure safe use of platforms, scaffolds, and fall arrest systems.

5.4 Explain the procedure to follow to erect and to dismantle scaffolds

5.5 Identify any structural deficiencies.

5.6 Recommend replacement of damaged, unsafe, or worn scaffold components.

5.7 Identify how to secure all scaffold attachments to ensure the protection of self and others.

5.8 Identify personnel lifting devices, swing stages, and bosun's chairs.

5.9 Identify various approved power lifts and hoists.

Number:	S00021.6	
Title:	**Lock Out and Tagging Procedures**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00023, S00026	
Cross Reference to Training Standards:	U5455	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to lock out and tag mechanical and electrical equipment according to applicable codes and company/customer standards.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

6.1 Determine which conditions would cause mechanical and electrical equipment to be tagged and locked out.

6.2 Describe how to lock out mechanical and electrical equipment according to all applicable codes and customer/company standards.

6.3 Describe tagging procedures of defective mechanical and electrical equipment according to all applicable codes and customer/company standards.

6.4 Describe how to remove locked-out mechanical and electrical equipment according to all applicable codes and customer/company standards.

Number: S00021.7

Title: Operate and Maintain Tools

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5455

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to use, inspect, and maintain tools and equipment to ensure safe operation in accordance with CSI standards and manufacturers' operating instructions.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

7.1 Recognize various hand and power tools.

7.2 Recognize the applications of various tools and material handling equipment.

7.3 Select the appropriate tools and/or material handling equipment for a given job.

7.4 Operate the various tools and/or material handling equipment according to CSI, manufacturer, and client /customer standards.

7.5 Determine the inspection points of hand and power tools and equipment according to the manufacturers' operating instructions.

7.6 Determine the frequency of inspections required for hand and power tools, and equipment according to the manufacturers' operating instructions.

7.7 Identify routine maintenance schedules.

7.8 Perform routine maintenance according to the manufacturer and/or client/company schedules.

7.9 Ensure hand and power tools, and equipment are free from defects and in proper working condition before using.

7.10 Remove hand tools, power tools, and equipment from service, if found to be defective.

Number: S00021.8

Title: **Perform Housekeeping Duties**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5455

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to maintain a clean and safe work area.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

8.1 Identify and comply with all applicable codes and company/customer standards.

8.2 Identify the location of first aid equipment and supplies.

8.3 Identify the location of fire extinguishers.

8.4 Identify job conditions that require heating, ventilation, and lighting.

8.5 Store material and equipment in designated areas.

8.6 Erect protective barriers as required.

8.7 Remove debris to designated locations at intervals that will keep the work area clean and safe.

8.8 Recycle materials as required and where possible.

Number:	S00021.9	
Title:	**Read and Interpret Specifications and Shop Drawings**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00023, S00026	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to determine the weight, size, and any special rigging requirements needed to rig and hoist material and equipment in compliance with the OHSA and company/customer safety precautions.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

9.1 Recognize and use common rigging terms and abbreviations.

9.2 Demonstrate the use of standard weight tables to determine the weight of a given load.

9.3 Identify the weight, size, and centre of gravity of a given object.

9.4 Determine whether there are any special rigging and/or hoisting requirements for given materials or pieces of equipment.

Number: S00021.10

Title: **Inspect the Job Site**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to plan how to assess a site to determine if rigging and hoisting operations may be carried out in accordance with the OHSA and company/customer safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

10.1 Identify conditions which should be assessed before hoisting and rigging operations begin, including:
- soil conditions
- power lines
- overhead clearance
- underground services
- special conditions
- space requirements

10.2 Identify what steps must be taken if rigging conditions do not meet all safety requirements.

Number:	S00021.11	
Title:	**Determine the Required Equipment**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00024	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to determine the capacity of the hoisting equipment required in accordance with the OHSA and company/customer procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

11.1 Estimate the weight of the load to be lifted by using:
- bills of lading
- technical drawings and data
- estimation tables

11.2 Assist in the selection of the lifting or hoisting equipment by:
- calculating the load radius of the equipment used to hoist the load
- determining the boom angle of the hoist equipment
- determining the lift height of the equipment hoisting the load

Number:	S00021.12	
Title:	**Schedule the Lift**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recommend a process of hoisting and off-loading tasks in compliance with the OHSA, and company/customer policy.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

12.1 Plan a schedule for the arrival of material and equipment to be hoisted.

12.2 Prepare a schedule for hoisting equipment.

12.3 Plan to assign duties to the hoisting crews.

12.4 Plan to monitor hoisting crews.

Number:	S00021.13	
Title:	**Inspect the Rigging**	
Duration:	Total hours:	1
	Theory:	0
	Individual/Group Work:	0
	Out of Class Practical:	1
Prerequisites:	None	
Co-requisites:	S00021, S00024	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to inspect rigging and hoisting equipment to ensure it complies with OHSA, and company/customer safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

13.1 Identify the rigging and hoisting equipment that requires inspection.

13.2 Describe the inspection procedures for rigging and hoisting equipment.

13.3 Perform inspection procedures for a variety of rigging and hoisting equipment.

13.4 Calculate the safe working load and breaking strength for fibre rope.

13.5 Calculate the safe working load and breaking strength for wire rope.

Number: S00021.14

Title: **Connect the Equipment to the Rigging**

Duration: Total hours: 2

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 2

Prerequisites: None

Co-requisites: S00021, S00024

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to describe required rigging operations as they conform to Canadian Standards Association (CSA) standards, OHSA, and company/customer safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

14.1 Describe the use and purpose of rigging hardware.

14.2 Explain the use and purpose of rigging tools and devices.

14.3 Explain the use and purpose of standard types of fibre rope used when rigging.

14.4 Identify the use and purpose of standard types of wire rope used when rigging.

14.5 Estimate the safe working load of slings at different sling angles.

14.6 Tie a number of knots.

Number:	S00021.15	
Title:	**Secure the Hoisting Area**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to plan how to secure an area where rigging and hoisting operations are to take place.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

15.1 Plan to secure the area(s) where rigging and hoisting operations will or may take place.

15.2 Explain how to coordinate with other trades when preparing for a hoisting and rigging operation to take place.

15.3 State how to barricade an area where rigging and hoisting activities will be taking place.

Number:	S00021.16	
Title:	**Plan To Perform the Lift**	
Duration:	Total hours:	4
	Theory:	4
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to plan to perform the lift conforming to CSI standards, OHSA, and company/client safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

16.1 Plan to secure the area where the lift will be performed.

16.2 Plan how to connect the rigging equipment to the load.

16.3 Explain how and where to connect a tag line.

16.4 Plan the landing area.

Number:	S00021.17	
Title:	**Position, Secure and Disconnect the Load**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to describe a process for releasing hoisting equipment from the load and to plan the removal and storage of lifting devices, in compliance with the OHSA, and company/customer safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

17.1 Plan to position the load in the landing area.

17.2 Plan to secure the load in a safe manner.

17.3 Plan to release the hoisting equipment used.

17.4 Describe how to remove the lifting devices from the load.

Number: S00021.18

Title: **Communicate Throughout the Lift**

Duration: Total hours: 1

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 1

Prerequisites: None

Co-requisites: S00021

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to use signals in compliance with the OHSA, and company/ customer safety procedures.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

18.1 Determine when a signaler is required.

18.2 Demonstrate the use of International Hand Signals.

18.3 Identify situations when voice communications are to be used.

Number:	S00021.19	
Title:	**Remove and Store the Rigging Equipment**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to plan the removal and storage of lifting devices to comply with company/customer standards.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

19.1 Identify a designated storage area for the rigging and hoisting equipment.

19.2 Explain how and where to store the rigging and hoisting equipment.

Number: S00022

Title: **Plumbing Systems – Level 1**

Duration: 90 Total Hours

Theory: 90 Hours Practical: 0 Hours

Prerequisites: None

Co-requisites: S00022, S00023, S00024, S00025

Evaluation Structure:

Theory Testing	90%
Practical Exercises	
Final Assessment	10%

PIPE AND FITTING MATERIALS, PIPE SUPPORTS AND HANGERS:

Number:	S00022.1	
Title:	**Steel Pipe and Fittings**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00023	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify steel pipe and fittings composition, design, manufacture, terminology, available lengths and diameters, as well as previous and current approved uses.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Name the three different grades of steel pipe.

1.2 Explain how steel pipe diameters are measured through various diameters.

1.3 Identify the three different weights of steel pipe using the traditional designations.

1.4 State the letter designations for standard, strong, extra strong, and double extra strong steel pipe.

1.5 State the schedule number for standard wall thickness from 10 to 160.

1.6 Identify the three different types of fabrication used for steel pipe.

1.7 Identify the abbreviations OD and ID.

1.8 Explain the term, "nominal".

1.9 State the dimension used to identify iron pipe up to 12 inches in diameter.

1.10 Explain how different wall thicknesses will determine the cross sectional area of a pipe.

1.11 Identify the size range of iron pipe from 1/8 inch to 12 inches to over 12 inches.

1.12 Identify the advantages and disadvantages of iron and galvanized iron pipe and fittings.

1.13 Explain the difference between a "pressure fitting" and a "drainage fitting" and where each fitting may be used.

1.14 Identify fittings from a given sample including elbows, tees, unions, couplings, bushings, and nipples.

1.15 State the common joining methods used for iron pipe and fittings.

1.16 Identify the systems where iron pipe and fittings have been installed.

1.17 Identify the uses for iron or steel pipe and fittings, as outlined in the OBC, and the restrictions placed on them; then state the required approvals for steel pipe and fittings.

1.18 List the support requirements for iron or steel pipe installation of various sizes.

1.19 List factors to be considered when selecting steel pipe including:

- cost of material
- installation time
- availability
- flame and smoke ratings
- corrosion
- OBC limitations

Number:	S00022.2	
Title:	**Cast Iron Soil Pipe and Fittings**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify cast iron soil pipe and fittings, terminology, available lengths and diameters, as well as previous and current approved uses.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 State the size range of cast iron soil pipe and fittings.

2.2 Identify the four common types of joining methods used to join cast iron pipe and fittings together.

2.3 State the two different types of caulked joints that may be used for cast iron pipe and fittings.

2.4 State the types and available size range of mechanical joint couplings.

2.5 Identify and state the available size range for a bi-seal gasket.

2.6 Identify the function of oakum in a caulked joint.

2.7 Identify the abbreviation PC4.

2.8 Explain the purpose of lead or PC4 in a caulked joint.

2.9 State the minimum depth of lead or PC4-b required for a caulked joint.

2.10 Explain the common ways of cutting cast iron pipe.

2.11 Explain how to determine if a section of piping is cracked.

2.12 State the approved uses for cast iron soil pipe and fittings.

2.13 State the approved installation locations for cast iron pipe and fittings.

2.14 State the support requirements for cast iron pipe and fittings.

2.15 List factors to be considered when selecting cast iron pipe including:

- cost of material
- installation time
- availability
- flame and smoke ratings
- corrosion
- OBC limitations

Number: S00022.3

Title: **ABS Plastic Pipe and Fittings**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461 U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Identify the full name for the common abbreviation for ABS pipe.

3.2 Identify the joining methods of ABS pipe and fittings.

3.3 Identify the joining methods of ABS pipe and fittings to other plastics.

3.4 Identify the joining method of ABS pipe and fittings to non-plastic pipe and fittings.

3.5 State the standard colour for ABS pipe and fittings.

3.6 State what approvals are required for ABS pipe and fittings.

3.7 State the support requirements for ABS pipe and fittings.

3.8 Identify the standard pipe diameters for ABS pipe and fittings.

3.9 Identify the standard wall thickness for ABS pipe and fittings.

3.10 Explain how ABS pipe is ordered.

3.11 State the standard length for ABS pipe.

3.12 Identify and list the approved piping systems used for ABS pipe and fittings.

3.13 Explain the restrictions that are placed on ABS pipe and fittings.

Number:	S00022.4	
Title:	**PVC Plastic Pipe and Fittings**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Identify the full name for the common abbreviation for PVC pipe.

4.2 Identify the joining methods of PVC pipe and fittings.

4.3 Identify the joining methods of PVC pipe and fittings to other plastics.

4.4 Identify the joining methods of PVC pipe and fittings to non-plastic pipe and fittings.

4.5 State what approvals PVC pipe and fittings require.

4.6 State the support requirements for PVC pipe and fittings.

4.7 Identify the standard pipe diameters for PVC pipe and fittings.

4.8 Identify the different wall thicknesses available for PVC pipe and fittings.

4.9 Explain how PVC pipe is ordered.

4.10 State the standard lengths of PVC pipe.

4.11 Identify and list the approved piping systems used for PVC pipe and fittings.

4.12 Explain the restrictions that are placed on PVC pipe and fittings.

Number: S00022.5

Title: **CPVC Plastic Pipe and Fittings**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

5.1 Identify the full name for the common abbreviation for CPVC pipe.

5.2 Identify the joining methods of CPVC pipe and fittings.

5.3 Identify the joining methods of CPVC pipe and fittings to other plastics.

5.4 Identify the joining method of CPVC pipe and fittings to non-plastic pipe & fittings.

5.5 State what approvals CPVC pipe and fittings require.

5.6 State the support requirements for CPVC pipe and fittings.

5.7 Identify the standard pipe diameters for CPVC pipe and fittings.

5.8 Explain how CPVC pipe is ordered.

5.9 State the standard length for CPVC pipe.

5.10 Identify and list the approved piping systems used for CPVC pipe and fittings.

5.11 Explain the restrictions that are placed on CPVC pipe and fittings.

Number: S00022.6

Title: Polyethylene Plastic Pipe and Fittings

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

6.1 Identify the full name for the common abbreviation for PE pipe.

6.2 Identify the joining methods of polyethylene pipe and fittings.

6.3 Identify the joining methods of polyethylene pipe and fittings to other plastics.

6.4 Identify the joining method of polyethylene pipe and fittings to non-plastic pipe and fittings.

6.5 State the standard colours for polyethylene pipe and fittings

6.6 State what approvals polyethylene pipe and fittings require.

6.7 Identify the minimum pressure requirements for polyethylene pipe.

6.8 State the support requirements for polyethylene pipe and fittings.

6.9 Identify the standard pipe diameters for polyethylene pipe and fittings.

6.10 Identify the standard wall thickness for polyethylene pipe and fittings.

6.11 Explain how polyethylene pipe is ordered.

6.12 State the standard lengths of polyethylene pipe.

6.13 Identify and list the approved piping systems used for polyethylene pipe and fittings.

6.14 Explain the restrictions that are placed on polyethylene pipe and fittings.

Number: S00022.7

Title: **Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX/AL/PEX) Plastic Pipe, Cross-linked Polyethylene (PEX) Plastic Pipe, Polyolefin Plastic Pipe, and Fittings**

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

7.1 Identify the full name for the common abbreviation for PEX/AL/PEX, PEX, and Polyolefin.

7.2 Identify the joining methods of PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

7.3 Identify the joining methods of PEX/AL/PEX, PEX, and Polyolefin pipe and fittings to other plastics.

7.4 Identify the joining method of PEX/AL/PEX, PEX, and Polyolefin pipe and fittings to non-plastic pipe and fittings.

7.5 State the standard colours for PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

7.6 State what approvals PEX/AL/PEX, PEX, and Polyolefin pipe and fittings require.

7.7 State the support requirements for PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

7.8 Identify the standard pipe diameters of PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

7.9 Explain how PEX/AL/PEX, PEX, and Polyolefin pipe is sold.

7.10 State the standard lengths of PEX/AL/PEX, PEX, and Polyolefin pipe.

7.11 Identify and list the approved piping system used for PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

7.12 Explain the restrictions that are placed on PEX/AL/PEX, PEX, and Polyolefin pipe and fittings.

Number: S00022.8

Title: **Polyethylene/Aluminum/Polyethylene (PE/AL/PE) Composite Pipe and Polypropylene Pipe and Fittings (PP-R)**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different plastic pipe and fittings, distinguishing characteristics, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

8.1 Identify the full name for the common abbreviation for PE/AL/PE and PP-R pipe.

8.2 Identify the joining methods of PE/AL/PE and PP-R pipe and fittings.

8.3 Identify the joining methods of PE/AL/PE and PP-R pipe and fittings to other plastics.

8.4 Identify the joining method of PE/AL/PE and PP-R pipe and fittings to non-plastic pipe and fittings.

8.5 Identify the fitting used with PE/AL/PE and PP-R pipe.

8.6 State the standard colour for PE/AL/PE and PP-R pipe and fittings.

8.7 State what approvals PE/AL/PE and PP-R pipe require.

8.8 State the support requirements for PE/AL/PE and PP-R pipe.

8.9 Identify the standard pipe diameters for PE/AL/PE and PP-R pipe.

8.10 State how PE/AL/PE and PP-R pipe is ordered.

8.11 State the standard lengths for PE/AL/PE and PP-R pipe.

8.12 Identify and list the approved piping system used for PE/AL/PE and PP-R pipe.

8.13 Explain the restrictions that are placed on PE/AL/PE and PP-R pipe.

Number: S00022.9

Title: Copper Pipe and Fittings

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the distinguishing characteristics of copper pipe and fittings, including wall thicknesses, selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

9.1 Identify the four standard wall thicknesses for copper pipe.

9.2 Identify and explain the term, "degreased copper".

9.3 Identify the colour designation assigned to each wall thickness.

9.4 Identify the advantages and disadvantages of copper pipe and fittings.

9.5 State the standard diameters for copper pipe and fittings.

9.6 State the standard lengths for hard drawn and coiled copper pipe.

9.7 Identify which wall thickness may be purchased as hard drawn lengths, coils, or both.

9.8 State where soft copper pipe may be installed.

9.9 Explain why restrictions are placed on soft copper coils.

9.10 State where hard drawn copper pipe may be installed.

9.11 Explain why restrictions are placed on hard drawn lengths.

9.12 State the common joining methods for copper pipe and tubing.

9.13 Identify the approval agency for copper pipe.

9.14 Explain the difference between “drainage” and “pressure” copper fitting.

9.15 State the support requirements for various diameters of copper pipe installations.

9.16 Identify the precaution that must be taken if supports for copper pipe and fittings are not copper.

9.17 Identify and explain the purpose of a dielectric coupling and/or alternative methods of joining dissimilar material.

9.18 Explain where dielectric couplings need to be installed.

9.19 List factors to be considered when selecting copper pipe including:

- type of system
- corrosion
- cost of material
- installation time
- availability
- flame and smoke ratings

Number:	S00022.10	
Title:	**Glass Pipe and Fittings**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the distinguishing characteristics of glass pipe and fittings, including selection factors, applications, joining methods, and support requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

10.1 State the purpose of glass pipe and fittings.

10.2 State the available size range of glass pipe and fittings.

10.3 Explain the procedures used to cut glass pipe.

10.4 State the joining methods used to connect glass pipe and fittings.

10.5 Identify the approval agency for glass pipe and fittings.

10.6 State the approved uses for glass pipe and fittings.

10.7 State the approved installation locations for glass pipe and fittings.

10.8 List factors to be considered when selecting glass pipe including:

- type of system
- corrosion
- cost of material
- installation time
- availability
- flame and smoke ratings

10.9 State the support requirements for glass pipe and fittings.

Number:	S00022.11	
Title:	**Pipe Supports, Anchors, and Hangers**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify different pipe supports and hangers, as well as selection and installation factors.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

11.1 Explain the purpose of pipe supports, hangers, and anchors.

11.2 State the maximum vertical distances between supports.

11.3 Identify the largest size of pipe that may be supported by solid or perforated metal straphangers.

11.4 Identify the smallest threaded rod that may be installed to support the hanger

11.5 State the minimum pipe size that must be supported by metal rods.

11.6 Explain the type of fastener that may be used when attaching hangers to concrete or masonry.

11.7 List the factors to be considered when selecting a hanger or support.

11.8 List the factors to be considered when using anchors and guides to support an expansion joint.

11.9 List the factors to be considered to support underground piping systems.

11.10 Identify types of hangers and supports and describe how they are installed, including:

- strap hangers, ring hangers, clevis hangers, spring hangers, trapeze hangers, MJ pipe hangers, and roller hangers.
- beam clamps, riser clamps, pipe clamps, and U bolts
- threaded rod and threaded rod couplings
- pipe clips, pipe racks, concrete inserts, wall pipe supports, expansion plugs, support anchors, and threaded studs

11.11 List factors to be considered when selecting pipe supports, including:

- type of system
- installation time
- cost of material
- availability
- capacity

Number: S00022.12

Title: Joining Dissimilar Pipe Materials

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5455, U5457, U5458, U5460, U5461, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify methods of joining together dissimilar materials.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

12.1 Describe the common approved methods of adapting cast iron, plastic, copper, aluminum, asbestos cement, and glass pipe to each other incorporating:

- adaptors
- female adaptors
- caulking ferrules
- mechanical joint couplings
- slip joint adaptors
- connectite adaptors
- bushings
- dielectric couplings
- field cut couplings

12.2 Explain the restrictions placed upon slip joint adaptors, bushings, and mechanical joint couplings.

DRAINAGE SYSTEMS:

Number:	S00022.13	
Title:	**Drainage Terms and Definitions**	
Duration:	Total hours:	4
	Theory:	4
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify and apply drainage terms and definitions.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

13.1 Identify the code that lists the common drainage terms and definitions.

13.2 State the section of the OBC that contains drainage terms, definitions, and abbreviations of proper names.

13.3 Define the following terms identifying minimum pipe size, installation or system location, and other distinguishing characteristics, including:

- accessible
- back vent
- backwater valve
- basement
- branch
- branch vent
- building drain
- building sewer
- cleanout
- continuous vent
- developed length
- drainage system
- fixture
- fixture drain

- fixture outlet pipe
- fixture unit
- flood level rim
- horizontal branch
- nominally horizontal/vertical
- plumbing appliance
- plumbing
- sanitary building drain
- sanitary building sewer
- sanitary drainage pipe/system
- sanitary unit
- soil pipe
- soil stack
- stack vent
- storm building drain/sewer
- storm drainage pipe
- storm drainage system
- trap
- trap arm
- vent pipe
- vent stack
- venting system
- vertical leg
- waste pipe
- waste stack

13.4 Identify and list some of the common drainage terms and definitions by examining a drain plan and stack elevation drawing.

Number:	S00022.14	
Title:	**Cleanouts and Locations**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00025	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and install cleanout fittings and manholes.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

14.1 Identify the major causes of pipe blockages.

14.2 Explain the purpose of a cleanout fitting.

14.3 Identify the different types of cleanouts including:
- AB Malcolm
- Barrett
- Westmount
- in-line cleanouts
- end cleanouts
- fitting cleanouts
- tube-end

14.4 Describe the term, “accessible”.

14.5 Explain why the screws, nuts, and bolts (used to hold cleanout covers) must be brass or other corrosion-resistant material.

14.6 State the minimum size of cleanouts for drainage piping of various sizes.

14.7 Explain why a cleanout must be both gastight and watertight at all times.

14.8 State the spacing requirements for cleanouts installed on:

- sink wastes
- horizontal storm and sanitary drainage piping smaller and larger than 4 inches

14.9 Identify cleanout requirements for storm and sanitary building drains as they leave the building.

14.10 State the cleanout requirements for soil stacks, waste stacks, and rainwater leaders.

14.11 Explain where a cleanout must be installed on kitchen sink drainage piping.

14.12 Identify which fixtures require a removable style p-trap or must be equipped with a bottom plug cleanout p-trap.

14.13 Explain the cleanout requirements for running trap installations.

14.14 State the cleanout requirements for sanitary and storm building drains that change direction more that 45 degrees.

14.15 Identify where cleanouts must be installed for interceptor installations and to serve wall-hung urinals.

14.16 State where cleanout fittings must be installed on an indirect waste system.

14.17 Explain where manholes must be installed both inside and outside a building and state their minimum dimension, listing installation requirements inside a building.

Number:	S00022.15	
Title:	**Prohibited Fittings and Connections**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00025	
Cross Reference to Training Standards:	U5455, U5457, U5458, U5460, U5461, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the problems caused by and reasons for prohibited fittings and connections.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

15.1 Define the terms vertical and horizontal as they are applied to plumbing installations.

15.2 Identify standard drainage fittings including elbows, branched fittings, adaptors, and reducing fittings.

15.3 Identify the pipe fittings that may not be installed in the horizontal plane in drainage applications.

15.4 Explain the possible problems that occur if pipe fittings are installed in unapproved positions.

15.5 State the minimum barrel and branch size for a double TY to be installed in drainage piping.

15.6 Identify the conditions where copper pipe may be drilled or tapped.

15.7 Identify the conditions where drainage pipe may be drilled or tapped.

15.8 Identify the location and the conditions that must be met to allow the installation of a saddle hub.

15.9 Identify the pipe materials that may be installed above ground, inside a building.

15.10 Identify the correct and incorrect fitting installations.

15.11 Explain why some drainage materials are restricted to above ground installation only.

Number:	S00022.16	
Title:	**Purpose of a Drain Plan**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the items that are shown on a drain plan, its approval process, and its uses after the construction is complete.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

16.1 Identify the items normally shown on a drain plan including:
- sanitary and storm building drains
- foundation drain connections
- down spout/leader connections
- floor drain connections
- trap seal primers
- cleanouts
- any other required sanitary and storm drainage piping

16.2 Explain the main uses of a drain plan.

16.3 State the regulations to which a drain plan must conform for approval.

16.4 State the uses of a drain plan after the building is complete and occupied.

16.5 Identify errors in a drain plan.

Number: S00022.17

Title: **How to Draw a Drain Plan**

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to draw drain plans.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

17.1 Explain in which form or view the horizontal drainage system for a building is normally shown.

17.2 State the drawing instruments required to draw a drain plan.

17.3 Explain how colour codes are used to illustrate sanitary drainage, storm drainage, and vent piping.

17.4 Explain how to illustrate single-line piping drawings.

17.5 Explain why the correct fittings must be illustrated on a drain plan.

17.6 Identify the common abbreviations used in conjunction with drain plan including:

- BD
- BS
- FAI
- BWV
- CO
- DS
- FD
- SS
- WS
- TSP
- LT
- WC

17.7 Explain how drainage piping installed at different elevations is illustrated.

17.8 State why storm and sanitary drainage pipe should be located in the same trench.

17.9 Explain how traps serving floor drains, showers, or other floor-mounted fixtures are illustrated on a drain plan.

17.10 State how trap seal primer connections are indicated on a drain plan.

Number:	S00022.18	
Title:	**Foundation Drains**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the connection points, locate cleanouts, explain how to protect from back flooding, and illustrate foundation drains.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

18.1 Define the term, "foundation drain".

18.2 Identify where foundation drains are installed.

18.3 Explain the purpose of a foundation drain.

18.4 State the type of discharge that flows through foundation drains.

18.5 State the possible consequences of not installing foundation drains.

18.6 Identify where foundation drains may discharge.

18.7 Explain why a foundation drain should not connect to a septic tank, holding tank, or any type of private sewage disposal system.

18.8 State the minimum number of foundation drains required.

18.9 Identify where cleanout fittings must be installed in foundation drain piping.

18.10 Define the term, "backwater valve".

18.11 Explain the purpose of a backwater valve.

18.12 State why some municipalities require the installation of backwater valves.

18.13 Identify where a backwater valve should be installed, if required.

18.14 State why down spout and foundation drains should not be connected together.

18.15 Draw a number of drain plans, incorporating the foundation drain, down spout and rainwater leader piping connections.

Number: S00022.19

Title: **Floor Drains**

Duration: Total hours: 3

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to define a floor drain, identify floor drains, state the allowable discharge locations, illustrate the piping connections, as well as size, and illustrate the required trap seal primer piping.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

19.1 State what code sections outline the installation requirements for floor drains.

19.2 Define a floor drain.

19.3 State the minimum drainage pipe size required for a floor drain.

19.4 Determine the minimum size of floor drain, based on potential flow rates.

19.5 Determine minimum trap seal depth, including static pressure.

19.6 Identify where floor drains must be installed.

19.7 Explain where the discharge from a floor drain may discharge according to applicable codes.

19.8 Explain when the discharge from a floor drain may discharge to the storm drainage systems.

19.9 Identify a floor drain grate and explain its purpose.

19.10 State the type of construction where floor drain grates are normally installed.

19.11 Identify a manufactured floor drain body and explain its purpose.

19.12 State the type of construction where a floor drain body is normally installed.

19.13 Identify some common options that may be ordered with a floor drain body.

19.14 State when the waste pipe serving a floor drain does and does not require a vent connection.

19.15 State the common causes of trap seal loss for floor drains.

19.16 Explain how the trap seals in floor drain traps are maintained.

19.17 Define the trade term, “gang trapping”.

19.18 State when floor drains may be gang trapped.

Number: S00022.20

Title: Hub Drains and Funnel Floor Drains

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to define, identify, and describe the installation requirements for hub drain and funnel floor installations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

20.1 Define the terms "hub drain" and "funnel floor drain".

20.2 Explain the purpose of a hub drain and a funnel floor drain.

20.3 Explain why the flood-level rim of a hub drain must be installed above the floor drain.

20.4 Explain the difference between a hub drain and a funnel floor drain.

20.5 State the minimum size of a hub drain or a funnel floor drain.

20.6 Explain how to size a hub drain or funnel floor drain.

20.7 Identify to which drainage system a hub drain or funnel floor drain must be connected.

20.8 Describe the trap seal primer requirements of a hub drain or a funnel floor drain.

20.9 State the installation locations of a hub drain or funnel floor drain.

20.10 Explain where a hub drain or funnel floor drain cannot be installed.

Number: S00022.21

Title: **Trap Seal Primers**

Duration: Total hours: 3

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465, U5466, U5468

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to explain the purpose of a trap seal primer and its installation requirements, as well as install a trap seal primer.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

21.1 Define the trade term, "trap seal primer" and explain its purpose.

21.2 Identify different types of trap seal primers and trap seal loss prevention devices including:

- manufactured trap seal primers
- drinking fountain wastes
- residential laundry tub faucets
- connections to flush valves flush tubes
- water-using equipment
- urinal flush tanks
- trap seal anti-evaporation devices

21.3 Explain the principle of operation of manufactured trap seal primers and anti-evaporation devices.

21.4 Describe the piping arrangement for a manufactured trap seal primer, when used to prime floor drains, and state the minimum pipe size that may be used.

21.5 Describe the drainage piping arrangement of a drinking fountain when used to prime a floor drain.

21.6 Describe the piping arrangement when installed to prime floor drains for:

- a urinal flush tank
- flush tubes from flushometers

21.7 Explain the conditions that must be met when using equipment to prime floor drains.

21.8 Explain whether the water used to prime floor drains must be potable.

21.9 State what steps must be taken if the water used to prime floor drains is not potable.

21.10 Define the terms air gap and, in relationship to a floor drain, flood-level rim.

21.11 Describe how a cross-connection may be created when installing a trap seal primer.

21.12 Explain how an air gap or a backflow prevention device may be incorporated into the trap seal primer installation to prevent a possible backflow condition.

Number: S00022.22

Title: **Drainage System Design**

Duration: Total hours: 3

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465, U5466, U5468

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize and design drainage systems, incorporating different drainage system designs.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

22.1 Define the terms:
- municipal sanitary sewer
- municipal storm sewer
- combined building sewer
- combined building drain
- semi-combined building sewer
- semi-combined building drain
- running trap

22.2 Review the definitions of separate building sewer and separate building drain.

22.3 Explain the terms, "combined and semi-combined drain systems".

22.4 Identify the components of a running trap.

22.5 State where the cleanout must be installed with a running trap.

22.6 State where a running trap must be installed in combined and semi-combined systems.

22.7 Identify the connection of a fountain drain and how a down spout connection is made to

- separate drainage system
- combined drainage system
- semi-combined drainage system

22.8 State where combined and semi-combined drainage systems may be found in service.

22.9 State where a separate system may be installed.

22.10 Identify the three drain designs that have been installed in Ontario.

22.11 Identify the most common drain design system currently installed.

22.12 Explain why combined drainage systems have been prohibited.

22.13 Describe the steps required to convert a semi-combined system into a separate drainage system.

Number: S00022.23

Title: **Building Traps**

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465, U5466, U5468

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize a building trap, the purpose of the installation, the piping arrangement, and the disadvantages of the installation.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

23.1 Define the term, "building trap".

23.2 Describe the component parts of a building trap installation.

23.3 State the minimum size of a building trap.

23.4 Describe the purpose of a building trap.

23.5 Identify the types of neighborhoods where building traps may have been installed.

23.6 Identify the possible installation locations of a building trap.

23.7 Define the term, "fresh air inlet".

23.8 Describe the purpose of a fresh air inlet.

23.9 Identify the installation location of a fresh air inlet and state its minimum size.

23.10 Describe the circulation of air through the drain, waste, and vent system with the installation of a building trap.

23.11 Explain why building traps are generally no longer installed on sanitary systems.

Number: S00022.24

Title: **Purpose of a Stack Elevation**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify the items that are shown on a stack elevation, its approval process, and its uses after the construction is complete.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

24.1 Identify the items normally shown on a stack elevation including:

- sanitary and storm building drains
- foundation drain connections
- down spout/leader connections
- floor drain connections
- trap seal primers
- cleanouts
- building traps
- fixture traps
- backwater valves
- drainage systems
- venting systems
- vent terminal information
- any other required sanitary and storm drainage piping

24.2 Explain the main uses of a stack elevation.

24.3 State the regulations to which a stack elevation must conform for approval.

24.4 State the uses of a stack elevation after the building is complete and occupied.

24.5 Identify errors in a stack elevation.

Number: S00022.25

Title: **How to Draw a Stack Elevation**

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465, U5466, U5468

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to draw stack elevations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

25.1 Explain the purpose of a stack elevation.

25.2 Explain which form or view of the vertical drainage system for a building is normally shown.

25.3 State the drawing instruments required to draw a stack elevation.

25.4 Identify the colour code used to illustrate sanitary drainage, storm drainage, and vent piping.

25.5 Explain why the correct fittings must be illustrated on stack elevations.

25.6 Explain how the traps for laundry tubs, kitchen sinks, and lavatories should be shown on a stack elevation.

25.7 Explain how the fixture traps for fixtures (other than laundry tubs, kitchen sinks, and lavatories) should be shown on a drain plan.

25.8 Explain how vent connections are shown on a stack elevation.

25.9 Illustrate the connections of fixtures and devices on a stack elevation.

25.10 State the information that should be shown at stack terminals.

25.11 Size all piping shown on the stack elevation.

25.12 Identify where cleanouts should be shown.

25.13 Explain the type of line that should be used to illustrate the stack vent.

WASTE PIPE SYSTEMS:

Number:	S00022.26	
Title:	**Traps and Types**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize different types of traps, identify the distinguishing characteristics of a trap, the purpose of a trap, and the installation of a trap.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

26.1 Define the terms, "trap", "trap seal", and "running trap".

26.2 State the purpose of a trap.

26.3 List the qualities of a well-designed trap.

26.4 Identify the dip, weir, and crown of different traps.

26.5 Describe how to measure the trap seal in a trap.

26.6 State the liquid level when the trap is at rest, the minimum trap seal for a trap, and the minimum trap seal for traps installed in an acid-waste system.

26.7 Identify the requirements for traps installed with laundry tubs, sinks, and lavatories.

26.8 Identify the most common trap currently installed.

26.9 Identify an S-trap, bell trap, drum trap, and a bottle trap.

26.10 Identify the dip, weir, and crown in an S-trap, P-trap, bell trap, drum trap, and a bottle trap.

26.11 Explain where an S-trap, bell trap, drum trap, and a bottle trap may be installed in a drainage system.

26.12 Explain the term integral trap.

26.13 Identify the fixtures that operate with an integral trap.

26.14 State where a running trap may be installed in a drain, waste, and vent system.

26.15 Identify where a cleanout fitting must be installed with a running trap.

26.16 State the dip weir and crown for an S-trap, P-trap, bell trap, drum trap, and a bottle trap.

Number:	S00022.27	
Title:	**Trap Sizing**	
Duration:	Total hours:	1
	Theory:	1
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to determine trap sizes.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

27.1 Explain the terms, "fixture outlet pipe" and "vertical leg".

27.2 Identify where a fixture outlet pipe is installed in relation to a plumbing fixture and its trap.

27.3 State the maximum length of a fixture outlet pipe.

27.4 Identify where a vertical leg is found in a drainage system.

27.5 State the maximum length of a vertical leg.

27.6 Explain how to determine the fixture outlet pipe size and the trap size for a selection of plumbing fixtures and appliances.

27.7 List the trap size for a selection of plumbing fixtures and appliances.

27.8 List the trap sizes for fixtures, appliances, and devices not listed in the OBC.

Number: S00022.28

Title: Trap Seal Loss

Duration: Total hours: 3

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to describe trap seal loss and to install traps to prevent trap seal loss.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

28.1 Define the terms "trap seal loss", "self-siphonage", "indirect siphonage", "oscillation", "capillary action", "back pressure", and "leak".

28.2 Define how much loss of a trap seal constitutes trap seal loss.

28.3 Explain how self-siphonage and indirect siphonage of a trap seal takes place.

28.4 State what measures must be taken to prevent self-siphonage and indirect siphonage.

28.5 Explain how oscillation, capillary action, and backpressure takes place and how it affects a trap seal.

28.6 State what measures may be taken to help control oscillation of a trap seal.

28.7 State what measures may be taken to help control trap seal loss due to capillary action and backpressure.

28.8 Explain how a leak will affect a trap seal.

28.9 State what measures are taken to identify and repair leaks.

Number:	S00022.29	
Title:	**Fixture Drain Requirements**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to install waste pipes that meet OBC requirements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

29.1 Define the terms, "fixture drain" and "trap arm".

29.2 Identify a fixture drain/trap arm in a drain, waste, and vent system from a given drain plan and/or stack elevation

29.3 Describe the function of a fixture drain/trap arm.

29.4 State the minimum size of a given fixture drain/trap arm.

29.5 State the minimum and maximum length of a fixture drain/trap arm.

29.6 Explain why fixture drains/trap arms have a limited minimum and maximum length.

29.7 Explain the term, "developed length".

29.8 State the maximum change of direction in a fixture drain/trap arm serving a siphonic fixture and a P-trap fixture.

29.9 Explain why fixture drains/ trap arms are limited in total change of direction.

29.10 State the total fall allowed on a fixture drain/trap arm.

29.11 Explain why fixture drains/trap arms have a limited minimum and maximum fall.

29.12 State the minimum fall allowed on a fixture drain/trap arm of a given size.

Number: S00022.30

Title: Sanitary Drain System Sizing

Duration: Total hours: 6

Theory: 6
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00024, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to size all sections of the sanitary drainage system on drain plans, stack elevations, and practical assignments.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

30.1 Define the terms "fixture unit", "litre per minute flow", "hydraulic load", "maximum hydraulic load", and "horizontal branch", used in conjunction with drainage systems.

30.2 Describe the purpose for which the fixture unit is developed.

30.3 Identify and use tables to:

- calculate fixture unit loading
- size 1¼", 1½" and 2" horizontal drainage piping
- size 1¼", 1½" and 2" vertical drainage piping
- size 3" and larger horizontal drainage piping
- size 3" and larger vertical drainage piping
- convert fixture units to litres per minute flow

30.4 Identify the restrictions when connecting water closets to 3" drainage piping.

30.5 State the minimum allowable fall on drainage piping.

30.6 Explain how grade affects the capacity of a given horizontal drainage pipe.

30.7 Complete a number of elevations and drain plans sizing all the drainage piping.

Number:	S00022.31	
Title:	**Grading Waste Pipes**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00024, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, define, and grade waste pipes.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

31.1 State the purpose of having fall or grade on drainage piping.

31.2 Explain how velocity of flow in drainage piping is controlled.

31.3 Describe the conditions that may develop if there is too little or too much fall on a drainage pipe.

31.4 Identify and list the name and diameters of horizontal drainage piping that may be usually installed with a minimum grade of 1:50 (¼ inch per foot) fall.

31.5 Identify and list the name and diameters of horizontal drainage piping that may be installed with a minimum grade of 1:100 (⅛ inch per foot) fall.

31.6 Identify and describe the three methods used to grade horizontal drainage pipe.

31.7 Calculate the total fall on a horizontal drainage pipe.

31.8 Calculate the length of a horizontal drainage pipe.

31.9 Calculate the fall or grade per foot of a horizontal drainage pipe.

VENTING SYSTEMS:

Number:	S00022.32	
Title:	**Purpose of Venting**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to explain the purpose of venting.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

32.1 Define the term, "venting system".

32.2 Describe the primary purpose of a vent in the drainage system.

32.3 Explain the secondary benefits of venting the drainage system.

32.4 Describe the movement of air within the venting.

32.5 Describe the principles of a siphon as it relates to venting.

Number: S00022.33

Title: Types of Individual Vents

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, and incorporate different types of individual vents.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

33.1 Define the trade terms "individual vent", "back vent", "flood level rim", and "continuous vent".

33.2 Explain how a back vent must be installed in relation to the fixture drain.

33.3 Explain the term, "hydraulic gradient".

33.4 Explain why a back vent will back flood.

33.5 Identify how high a back vent may back flood from a given stack elevation.

33.6 Explain why a continuous vent will not back flood as high as a back vent installation.

33.7 Explain why the total length of an individual vent installed below the flood level rim must be kept to a minimum.

33.8 Identify and explain the minimum level or height to which individual vents must rise before they may be connected together.

33.9 Explain the outcome if a vent is installed with a dip, sag, or depression.

33.10 Describe how to determine the maximum developed length of an individual vent.

33.11 State the maximum length of a 1¼", 1½", 2", 2½", 3", 4", 5", and 6" individual vent.

Number: S00022.34

Title: **Sizing Individual Vents**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00024, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to size individual vents.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

34.1 Identify the tables used when determining individual vent pipe size.

34.2 Use the tables to determine individual vent pipe size.

34.3 Explain why a water closet vent has a higher load factor than other individual vents of the same size.

34.4 State the individual vent size for a given trap size.

Number:	S00022.35	
Title:	**Branch Vents**	
Duration:	Total hours:	5
	Theory:	5
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, size, and install branch vents.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

35.1 Define the term, "branch vent".

35.2 State the purpose of a branch vent.

35.3 List the factors used to determine branch vent sizing.

35.4 Identify the tables used to size branch vents.

35.5 Explain the minimum branch vent size required to serve a given combination of fixtures.

35.6 Identify the specific locations on a branch vent where an increase in pipe size would be required.

Number: S00022.36

Title: Dual Venting

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, size, and install dual vents.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

36.1 Explain the terms, "group venting" and "dual venting".

36.2 Explain the purpose of dual venting.

36.3 Identify both the acceptable and unacceptable fittings for dual venting installations.

36.4 Identify where the trap arms must connect when dual venting.

36.5 Explain the problems that could occur if an unacceptable drainage fitting were to be installed in a dual-vented installation.

36.6 State the maximum total fall permitted on each trap arm in a dual-vented group.

36.7 State the maximum distance permitted between a fixture trap and its dual vent.

36.8 Identify and list the group of fixtures that would be well suited for a dual-venting installation.

36.9 State the installation requirements of a dual-vented installation prescribed in the OBC.

Number: S00022.37

Title: Wet Venting

Duration: Total hours: 10

Theory: 10
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, size, and install wet-vented installations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

37.1 Describe the term, "wet vent".

37.2 State the purpose of wet venting and its advantages.

37.3 List the number of fixtures that may be installed in a wet-vented group.

37.4 Define a wet-venting fixture and a wet-vented fixture.

37.5 List the types of fixtures which may be wet-venting and which may be wet-vented.

37.6 Identify where a wet vent must connect to a fixture waste pipe when wet venting a siphonic fixture and a p-trap fixture.

37.7 List the wet vent pipe sizes for wet-vented traps.

37.8 Explain where a continuous vent must be installed in a wet-vented installation.

37.9 State the reason for the installation of a continuous vent in a wet-vented group installation.

Number: S00022.38

Title: **Roof Flashings**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, size, and install roof flashings.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

38.1 Define the trade term "roof flashing".

38.2 Explain the purpose of a roof flashing.

38.3 State the common materials that may be used to construct a roof flashing.

38.4 State the minimum size of a manufactured roof flashing.

38.5 Explain how a roof flashing may reduce the diameter of a stack terminal.

38.6 State why it is prohibited for a roof flashing to reduce the diameter of a stack terminal.

38.7 Identify a sleeve flashing.

38.8 Explain sleeve-flashing requirements.

38.9 Describe the position of a roof flashing on a pitched roof in relation to the shingles.

Number: S00022.39

Title: **Stack and Vent Terminals**

Duration: Total hours: 1

Theory: 1
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5462

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, describe, size, locate, and install stack terminals.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

39.1 Define the trade term "stack terminal" and "vent terminal".

39.2 Explain the purpose of a stack terminal.

39.3 State the minimum diameter of a stack terminal.

39.4 Explain why the locations of stack terminals are regulated.

39.5 Identify the air inlets that regulate the installation locations of stack terminals.

39.6 State the minimum distances stack terminals must be located from air inlets.

39.7 State the minimum height of a stack terminal installed on a pitched roof.

39.8 State the minimum height of a stack terminal installed on a flat roof designed to pond storm water.

39.9 State the minimum height of a stack terminal installed on a flat roof designed for human occupancy.

39.10 State the minimum height of a stack terminal that must be made stable and secure.

CODES, REGULATIONS AND STANDARDS:

Number:	S00022.40	
Title:	**Codes, Regulations and Standards**	
Duration:	Total hours:	3
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5462, U5463, U5464, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize, identify, and use the Ontario Building Code (OBC).

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

40.1 Describe the primary purpose of the OBC and Act.

40.2 Identify the section of the OBC that deals with code administration, terms,

40.3 definitions, abbreviations, symbols, and the installation of plumbing systems.

40.4 Identify and list the sections of Part 7 and identify the numbering systems used there including Part, Section, Subsection, Article, Sentence, Clause, and Sub-clause.

40.5 Identify the official system of measurement in the OBC.

40.6 Explain the purpose of italicizing a word or words used in the code.

40.7 Identify the code on which Part 7 of the OBC is based.

40.8 Identify the location and purpose of the index for Part 7 and location of Appendix A.

40.9 Explain the primary purpose of the appendix found in Part 7.

40.10 Explain why illustrations shown in the appendix cannot be an official part of Part 7.

40.11 Identify the people responsible for the enforcement of Part 7.

40.12 Identify the people who must comply with Part 7.

40.13 Identify municipal by-laws and regulations.

40.14 Identify certification and standards agencies (CSA, ULC, AWWA, etc.)

40.15 Identify manufacturers' specifications.

Number: S00023

Title: **TOOLS AND PIPING METHODS**

Duration: 48 Total Hours

Theory: 0 hours Practical: 48 hours

Prerequisites: None

Co-requisites: S00021, S00022, S00023, S00024, S00026

Evaluation Structure:

Oral/Written Testing	10%
Practical Exercises	70%
Final Assessment	20%

Number: S00023.1

Title: Measuring Tools and Instruments

Duration: Total hours: 1

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 1

Prerequisites: None

Co-requisites: S00021, S00023, S00024, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and use various measuring tools and instruments.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Identify and use a variety of measuring tools and instruments including:
- tapes and measures
- spirit levels
- straight edges
- squares
- protractors
- chalk lines
- builders level
- laser instruments gauges, meters and recorders for air, water, oil, and gas

1.3 Identify various applications of measuring tools and instruments.

1.4 Select measuring tools and instrument based on:
- application
- instrument limitations

1.5 Adjust measuring instrument for zero error if applicable.

1.6 Set up and use different measuring instruments.

1.7 Interpret instrument readings by giving the correct value and unit of measurements.

1.8 Maintain and store measuring instrument.

Number: S00023.2

Title: Identify and Use Various Hand Tools

Duration: Total hours: 1

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 1

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and use various hand tools.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 Identify and use the following hand tools including:

- screwdrivers
- Allen keys
- chisels
- snips
- saws
- files
- reamers
- clamps
- pliers
- pipe cutters
- hand threaders
- vises
- flaring tools
- swaging tools
- bending tools
- drifts and punches

- taps and dies
- wrenches, including: pipe, adjustable, torque, socket and combination box, and open wrenches
- stud and bolt extractors
- gear pullers
- drill bits including: wood, metal, and masonry

2.2 Identify the types of hand tools according to:
- size and design including number and symbol classification
- application to specific materials
- capacity
- operation

2.3 Identify the methods of assembly and adjustments for various hand tools.

2.4 Assemble, adjust, and maintain various hand tools in safe working order.

2.5 Determine, demonstrate, practice, and maintain the methods of using hand tools for safe, restricted, and efficient operation.

Number: S00023.3

Title: Identify and Use Various Power Tools

Duration: Total hours: 2

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 2

Prerequisites: None

Co-requisites: S00021, S00023, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and use various power tools.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Identify, select and use the following types of power tools including:
- electric drills
- power saws
- grinders
- pipe cutters
- threading machines
- drill press
- grooving machines
- hydraulic press
- chop saws
- crimpers
- pneumatic tools & compressors

3.2 Identify the required power tools base on:
- types and sizes
- operating range
- application

3.3 Select power tool accessories based on the specified types, applications and tolerances, and materials to be worked on.

3.4 Identify power tools, equipment, and accessories by model number and/or symbol.

3.5 Determine the power requirements of the tools by checking the voltage, amperage, and grounding requirements.

3.6 Identify and list the common hazards related to the use of power tools, equipment, and accessories.

3.7 Operate, adjust, maintain, and store the power tools, equipment, and accessories in accordance with the manufacturers' instructions.

3.8 Determine and demonstrate the safe operation of power tools, equipment, and accessories.

Number: S00023.4

Title: **Steel Pipe Joining Methods**

Duration: Total hours: 3

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 3

Prerequisites: None

Co-requisites: S00022, S00023, S00024

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and assemble steel pipe, using various joining methods.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Name the types of pipe materials that may be joined using a threaded connection.

4.2 State the advantages of standardizing pipe threads.

4.3 Identify the terms used in conjunction with an American Standard Pipe Thread.

4.4 State the number of threads per inch for pipe sizes ranging from ⅛ to 3 inch.

4.5 Explain the terms, “thread engagement” and “pipe engagement”.

4.6 List the pipe diameters that may be threaded with the same die chasers.

4.7 Explain the importance of having the correct thread engagement on a threaded connection.

4.8 Describe and demonstrate threaded, grooved, flanged, and welded joining methods.

4.9 Cut to length, ream and thread, then test a number of pipe threads for pipe sizes ranging from ½" to 3" pipe.

4.10 Fabricate various sizes of nipple chucks.

4.11 Describe the method of preparing a pipe end for a grooved joint.

4.12 Cut to length, roll groove and cut groove, then test a number of pipe ends for pipe sizes ranging from 2" to 4".

4.13 Cut, bevel, and square up a welded pipe joint.

4.14 Describe the methods used to prepare a flanged connection, including gasketing, sequencing, and torquing.

Number: S00023.5

Title: **Cast Iron Pipe Joining Methods**

Duration: Total hours: 2

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 2

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5457 U5458 U5459 U5460 U5461 U5463 U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and assemble cast iron soil pipe, using a variety of joining methods.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

5.1 Identify cast iron soil pipe and fittings.

5.2 Check for defective cast iron soil pipe and fittings.

5.3 Cut to length a variety of cast iron soil pipe sizes, using different cutting methods.

5.4 Fabricate and test various hub and spigot caulked joints.

5.5 Identify and name the two types of compression joints used with cast iron soil pipe and fittings.

5.6 Fabricate and test mechanical joint couplings and bi-seal joints for a number of cast iron soil pipe sizes.

Number: S00023.6

Title: Copper Pipe Joining Methods

Duration: Total hours: 3

Theory:
Individual/Group Work: 0
Out of Class Practical: 3

Prerequisites: None

Co-requisites: S00022, S00023

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, select, and assemble copper pipe and fitting, using a variety of joining methods.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

6.1 Describe different soldering processes and name two solder groups.

6.2 State the deciding factor in the selection of the solder to be used.

6.3 Describe the conditions that effect piping systems that should be considered when selecting a solder.

6.4 Explain how solder is drawn into a copper pipe joint and demonstrate capillary action between the pipe, fitting, and solder.

6.5 Identify the common soft solders, including:
- 95-5
- 50-50
- 40-60
- lead-free

6.6 Identify the applications for common soft solders.

6.7 Identify the content mentioned first in a tin-lead solder.

6.8 State the type of solder and the maximum allowable lead content for solders that must be used on potable water systems.

6.9 Identify the common hard solders including:
- silver solder
- sil-fos
- brazing

6.10 Identify the applications for common hard solders.

6.11 Explain when hard soldering would be used instead of soft soldering.

6.12 Name the dissimilar metals that may be joined by both hard and soft soldering.

6.13 Explain the purpose of a solder flux.

6.14 State the effects of heat on flux.

6.15 State the factors to be considered when selecting a flux.

6.16 Describe the surface preparation for the surface of the pipe and fitting before applying a flux.

6.17 Identify the two basic types of flux, two active fluxes, and two non-active fluxes.

6.18 Describe what should be done to a solder joint after using a corrosive flux.

6.19 Cut to length, ream, clean, flux, soft solder, then test copper pipe-fittings ranging in size from ½" to 3".

6.20 Cut to length, ream, clean, flux, hard solder, then test copper pipe-fittings ranging in size from ¼" to 1".

6.21 Identify the type of copper pipe that may be roll grooved.

6.22 Explain the preparation required when roll grooving copper pipe.

6.23 Cut to length, roll groove, assemble, and test copper pipe-fittings.

6.24 Identify various mechanical joint methods.

Number:	S00023.7	
Title:	**Build Piping Projects Incorporating Different Offsets**	
Duration:	Total hours:	36
	Theory:	0
	Individual/Group Work:	0
	Out of Class Practical:	36
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00024	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, calculate, and assemble a variety of piping projects incorporating different materials and offsets.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

7.1 Define the terms, "pipe offset", "parallel offset", and "rolling offset".

7.2 Identify 22½°, 30°, 45", and 60° piping offsets.

7.3 Calculate 22½°, 30°, 45", and 60° piping offsets.

7.4 Calculate the end to end measurements, cut, prepare, assemble, test, and dismantle a number of piping projects (using steel, cast iron soil copper, and plastic piping), including:

- single 45° pipe offset
- parallel 45° pipe offset
- rolling 45° single pipe offset
- rolling 45° double pipe offset

7.5 Incorporate into the pipe offset assignments the connections, including:

- threaded
- soft soldered
- hard soldered
- solvent cement
- grooved
- flanged
- flared
- mechanical
- crimp
- compression

All projects shall be constructed and evaluated to code standards, pressure tests, and dimensional tolerances.

Number:	S00024
Title:	**Trade Calculations – Level 1**
Duration:	24 Total Hours
	Theory: 24 hours Practical: 0 hours
Prerequisites:	None
Co-requisites:	S00022, S00023, S00024, S00025, S00026

Evaluation Structure:

Theory Testing	70%
Practical Exercises	20%
Final Assessment	10%

Number:	S00024.1	
Title:	**Basic Math**	
Duration:	Total hours:	6
	Theory:	6
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00024, S00025, S00026	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate ability in basic arithmetic functions with whole numbers.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Identify whole numbers, fractions, and decimals.

1.2 Multiply, divide, add, and subtract whole numbers, fractions, and decimals manually.

Number:	S00024.2	
Title:	**Conversions of SI to Imperial and US Values**	
Duration:	Total hours:	5
	Theory:	5
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00024, S00025	
Cross Reference to Training Standards:	U5457 U5458 U5459 U5460 U5461 U5463 U5464 U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to convert SI to Imperial measurements and Imperial to SI measurements.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 Identify the standard units used in the SI system.

2.2 Identify the standard units used in the Imperial system.

2.3 Convert linear measures from SI to Imperial and Imperial to SI.

2.4 Convert volume measurements from SI to Imperial and Imperial to SI.

2.5 Convert area measurements from SI to Imperial and Imperial to SI.

2.6 Calculate, given a Celsius reading, the equivalent reading on the Fahrenheit scale.

2.7 Calculate, given a Fahrenheit reading, the equivalent reading on the Celsius scale.

Number: S00024.3

Title: Linear Measurement

Duration: Total hours: 4

Theory: 4
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023, S00024, S00025, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, define, and use linear measurements in piping systems.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Explain the standard dimensioning used for pipe diagrams.

3.2 State the terms and abbreviations used for measuring pipe and fittings.

3.3 Define the terms:
- linear measurement
- fitting allowance
- pipe engagement
- face to face
- end to end
- center to center
- face of fitting
- back of fitting

3.4 Define any combination of the above piping terms.

3.5 Calculate and list the fitting allowances for various piping materials and sizes.

3.6 Calculate the end-to-end length of pipe necessary to fit pipe and fittings to the required end to center, center to center and end to back measurements, and the total length of piping required from a piping diagram.

Number: S00024.4

Title: Calculations of Various Offsets

Duration: Total hours: 7

Theory: 7
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00022, S00023, S00024, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464, U5465

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, define, and calculate various pipe offsets used in the piping industry.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Identify various pipe offsets including 22½°, 30°, 45", and 60° fittings.

4.2 Define the term, "rolling offset".

4.3 State why and explain where these various offsets are installed in plumbing systems.

4.4 Calculate the length of travel of a 22½° offset from a given measurement, using the factors of 2.61, 1.08, and 0.20.

4.5 Calculate the length of travel of a 30° offset from a given measurement, using the factor of 2.00".

4.6 Calculate the length of travel of a 45° offset from a given measurement, using the factor of 1.414.

4.7 Calculate the length of travel of a 60° offset from a given measurement, using the factors of 2.0, 1.16, and 0.58.

4.8 Calculate the length of travel for a rolled offset using 45° fittings when the length of the vertical rise and horizontal spread are given.

4.9 Calculate the length of travel for a 45° rolled offset and the length of run on each end of the offset.

Number:	S00024.5	
Title:	**Square Roots**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00024, S00025, S00026	
Cross Reference to Training Standards:	U5458, U5459, U5461, U5463, U5464, U5465	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to calculate square roots and solve problems involving calculation of square roots.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

5.1 Define the term, "square root".

5.2 Explain the use of calculating square roots in the plumbing industry.

5.3 Describe the methods of finding the square root of a number.

5.4 Calculate the square root for a selection of given numbers.

Number:	S00025
Title:	**Trade Documentation – Level 1**
Duration:	24 Total Hours
	Theory: 12 hours Practical: 12 hours
Prerequisites:	None
Co-requisites:	S00021, S00022, S00023, S00024, S00025, S00026

Evaluation Structure:

Theory Testing	40%
Practical Exercises	50%
Final Assessment	10%

Number:	S00025.1	
Title:	**Identify and Use Various Drafting Instruments**	
Duration:	Total hours:	6
	Theory:	3
	Individual/Group Work:	0
	Out of Class Practical:	3
Prerequisites:	None	
Co-requisites:	S00024, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify and use various drafting instruments.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Identify and use the following basic drafting instruments, including:
- architect's and engineer's scale in both SI and Imperial units
- set squares
- T-squares
- pencils
- erasers & eraser shields

1.2 Print legible numbers and letters and upper case letters.

Number: S00025.2

Title: **Identify and Draw Various Projection Drawings**

Duration: Total hours: 12

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 9

Prerequisites: None

Co-requisites: S00022, S00023, S00025

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify and draw various isometric and orthographic projection drawings.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 Define the terms, "orthographic projection" and "isometric drawing".

2.2 Identify three principle views in an orthographic projection.

2.3 Draw single pipe line drawings to scale in orthographic projection fully dimensioned.

2.4 Explain why isometric drawings and sketches are used in the plumbing industry.

2.5 Define isometric drawing principles.

2.6 Produce an isometric drawing of a single pipe line drawing given the corresponding three views by hand.

Number:	S00025.3	
Title:	**Identify and Interpret Construction Drawings**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00022, S00023, S00025	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify and interpret construction drawings.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Identify the standard types of construction trade drawings and prints.

3.2 Identify the individual drawings produced for the following trades, including:
- architectural
- structural
- mechanical
- electrical

3.3 List the trades that use each of the following drawings:
- architectural
- structural
- mechanical
- electrical

3.4 Identify and apply the basic symbols used in each of the drawings for a planned plumbing installation:
- architectural
- structural
- mechanical
- electrical

3.5 Define the term, "shop drawing".

3.6 List four purposes of shop drawings.

3.7 Identify the purpose of title blocks on drawings, containing the following information:

- drawing number
- drawing date
- name of company or firm
- signatures and approvals
- scales
- revisions

3.8 Identify and draw the types of lines used in single and multi-view drawings to indicate:

- objects lines
- center lines
- extension lines
- dimension lines
- hidden lines
- cutting plane lines
- break lines
- projection lines
- sections lines

Number:	S00025.4	
Title:	**Demonstrate Effective Interpersonal Relations**	
Duration:	Total hours:	2
	Theory:	2
	Individual/Group Work:	0
	Out of Class Practical:	0
Prerequisites:	None	
Co-requisites:	S00021, S00022, S00023, S00024, S00025, S00026	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to demonstrate effective interpersonal relations.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Use effective listening techniques.

4.2 Use language appropriate for the workplace.

4.3 Use of common trade terms and definitions correctly.

4.4 Explain the typical chain of command on a work site.

4.5 Explain trade-related problems, using verbal and non-verbal communications.

4.6 Identify and explain alternative solutions.

4.7 Seek and obtain approvals from appropriate personnel.

4.8 Verbally explain maintenance and warranty programs.

Number: S00025.5

Title: Receive and React to Instructions

Duration: Total hours: 2

Theory: 2
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00022, S00023, S00024, S00025, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to react to and carry out instructions.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

5.1 Listen to the instructions given.

5.2 Identify the key points given in the instructions.

5.3 Ask for clarification about any points which are not understood.

5.4 Repeat the instructions accurately.

5.5 Determine the feasibility and safety of the instructions and task assigned.

5.6 Identify the key tasks required by the instructions, including:
- gathering the materials required
- gathering the tools required
- performing the required work

5.7 Communicate with others to ensure the task is completed in a timely manner and in conformity with company and/or customer standards, specifications, and codes.

5.8 Seek clarification, if and when required.

Number:	S00026	
Title:	**Welding – Level 1**	
Duration:	24 Total Hours	
	Theory: 3 hours	Practical: 21 hours
Prerequisites:	None	
Co-requisites:	S00021, S00026	

Evaluation Structure:

Theory Testing	10%
Practical Exercises	80%
Final Assessment	10%

Number: S00026.1

Title: **Oxy-Acetylene Cutting and Welding Equipment and Accessories**

Duration: Total hours: 3

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 3

Prerequisites: None

Co-requisites: S00021, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify oxy-acetylene cutting and welding equipment and accessories, including the construction, operation, assembly, and disassembly.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

1.1 Describe the construction and operation of:
- oxygen cylinders
- acetylene cylinders
- welding torches
- cutting torches
- regulators
- hoses and fittings

1.2 Safely assemble and disassemble oxy-acetylene cutting and welding equipment.

1.3 Check equipment for safe operating condition.

Number:	S00026.2	
Title:	**Oxy-Acetylene Cutting Theory, Cutting and Welding Safety Requirements**	
Duration:	Total hours:	3
	Theory:	0
	Individual/Group Work:	0
	Out of Class Practical:	3
Prerequisites:	None	
Co-requisites:	S00021, S00026	
Cross Reference to Training Standards:	U5457, U5458, U5459, U5460, U5461, U5463, U5464	

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to identify, describe and demonstrate the theory of oxy-acetylene cutting.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

2.1 Safely set up equipment for oxy-acetylene cutting.

2.2 Select from a list the proper tip size, acetylene pressure, and oxygen pressure to cut a given metal thickness.

2.3 Safely turn on, light, adjust to a neutral flame, and shut down the oxy- acetylene cutting equipment.

2.4 Make 90^0 cuts on mild steel and restart a cut.

2.5 Cut a hole in mild steel.

2.6 List and sketch five methods of edge preparation for welded joints.

2.7 Prepare plate edges for butt-welding.

2.8 Prepare pipe by hand torch-cutting for a butt-weld joint.

Number: S00026.3

Title: Oxy-Acetylene Welding Principles

Duration: Total hours: 3

Theory: 3
Individual/Group Work: 0
Out of Class Practical: 0

Prerequisites: None

Co-requisites: S00021, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to recognize weld faults and control distortion.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

3.1 Name five factors that determine weld quality.

3.2 List five properties of a good weld.

3.3 Identify and sketch three types of oxy-acetylene welding flames.

3.4 Name two factors that determine tip selection in oxy-acetylene welding.

3.5 State the purpose of filler rod in oxy-acetylene welding.

3.6 List two factors that determine filler rod selection.

3.7 State the cause and control of oxy-acetylene welding faults.

3.8 State the cause and control of distortion.

Number: S00026.4

Title: Lay Down Beads, Prepare, Tack & Weld a Butt Joint

Duration: Total hours: 15

Theory: 0
Individual/Group Work: 0
Out of Class Practical: 15

Prerequisites: None

Co-requisites: S00021, S00026

Cross Reference to Training Standards: U5457, U5458, U5459, U5460, U5461, U5463, U5464

GENERAL LEARNING OUTCOMES

Upon successful completion the apprentice is able to demonstrate the ability to lay beads, tack, and weld butt joints with filler rod in the flat position.

LEARNING OUTCOMES

Upon successful completion the apprentice is able to:

4.1 Safely set up equipment for oxy-acetylene welding.

4.2 Select from a list the proper tip size, acetylene pressure, and oxygen pressure for a given metal thickness.

4.3 Safely turn on, light, adjust to a neutral flame, and turn off the oxy-acetylene welding equipment.

4.4 Lay beads on mild steel plate with filler rod.

4.5 Prepare butt joints to specifications for welding.

4.6 Tack weld butt joints to maintain alignment.

4.7 Weld butt joints with filler rod in the flat position.

Summary of Equipment Recommended for Level 1

Hand Tools:

adjustable wrench
ball-peen hammer
basin wrench
broom
calculator
caliper
caulking gun
chalk line
chisels
claw hammer
combination wrench
compass
copper tube cutter
crimpers
drywall saw
faucet seat wrench
flashlight
hacksaw
hand saw
hand threader
hex keys (set)
hole saw
knife
levels
measuring tape and markers
micrometer
pick
pipe clamp
pipe locator
pipe wrench
plastic tube cutters (set)
pliers (lineman, needle nose, water pump, channel locks)
plumb bob
pry bars
punch
ratchet
ratchet cutter
rubber mallet
scale rule
scratch awl
screwdrivers (complete set)
shovel
sledgehammer
snap cutter
socket set (Imperial and metric)
soldering and brazing torch
spud wrench
T square
tap and die sets
tin snips (set)
torque wrench
tri square
tube flaring tools
vice grips

Portable Power Tools:

chop saw
circular saw
concrete cutter
power drills
reciprocating saw

Hoisting and Rigging Tools and Equipment:

block and tackles
chain block hoist (endless chain)
come-alongs & Tirfors™
rope/cable
shackles (varying sizes)
slings and chokers
tuggers (power)
wire rope or nylon (synthetic)

Assorted Equipment:

air compressor & accessories
associated software
booster pump
builder's level
cellular phone
circular saw
computer
electrical tools
electronic leak detector
fax machine
hand pump and accessories
heat lamp
hydraulic cutter
hydrostatic pump & gauge
ladder
measuring instruments
oxy-acetylene welding equipment
pumps
steamer
telephone
testing documentation
tracing cable
two way radios
walkie-talkies

Protective Equipment:

face shield
fire blanket
fire extinguisher
first aid kit
gloves (industrial, rubber)
hard hat
hearing protection
lock-out
overalls
respiratory mask
safety boots
safety glasses/goggles
safety harness & life line

Cutting and Joining Equipment:

assembly tools and equipment
field lathes
file
hand-operated oiler
hot air gun (welder)
pipe cutter
pipe groover
pipe reamer
pipe roller
pipe stand
pipe vise
pipe threader
press-fit
Presto-lite™ gas tanks and soldering equipment
tee drill
tube bender
tube cutter
turbo torch